Aquaculture in B.C.

Getting Started

Province of British Columbia
Ministry of Agriculture and Fisheries
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Aquaculture

Aquaculture is the raising of animals and plants in salt or freshwater. The aquaculture industry, which involves mainly fish and shellfish, is expanding rapidly worldwide.

With 27,000 kilometres of coastline, B.C. is ideally suited for the development of a thriving aquaculture industry. Opportunities for freshwater aquaculture in B.C. lie mainly in raising trout and establishing salmon hatcheries. Saltwater opportunities currently centre on rearing salmon and growing oysters. Opportunities also exist for clams and mussels and the future production of abalone, scallops and sablefish (black cod).

British Columbia has proven to be an excellent climate, both environmental and commercial, for aquaculture operations. By 1990, aquaculture in this province promises to be a $200-million business employing as many as 3500 people. The industry itself will play the major role in aquaculture development, while the provincial, federal, and municipal governments will provide back-up support with a range of services that includes research and development, extension programs, fish health services, financial and marketing assistance, and the creation of a supportive business environment.

The provincial lead agency for aquaculture is the Ministry of Agriculture and Fisheries. It has been developing programs for aquaculture that will coordinate the efforts of government and industry to ensure the comprehensive development of B.C.'s aquaculture industry over the long term.

Because of differing levels of investment, aquaculture operations can range from small family enterprises to large corporate undertakings. Sound business and aquaculture development plans are essential to the success of any aquaculture enterprise. The work of an aquaculturist is long and hard, and the most successful operators are those who have both a good feel for raising living creatures and a solid technical background.

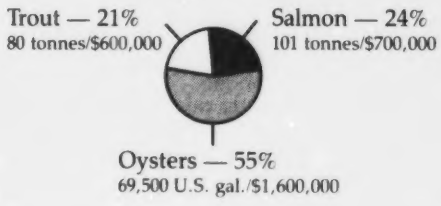
For people who are seriously considering becoming involved in aquaculture, this guide outlines the scope of the industry in B.C. and describes the process of starting and operating an aquaculture business.

British Columbia

Aquaculture Production

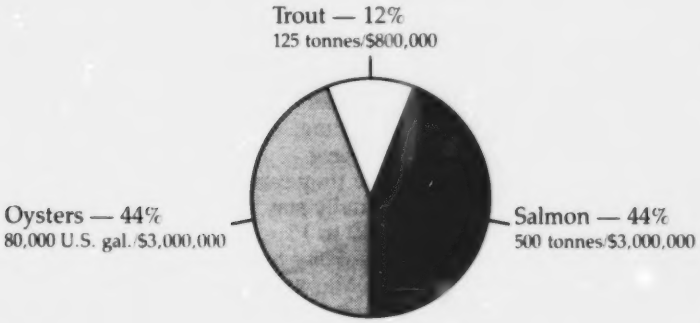
1984

TOTAL $2.9 Million



1986 (est.)

TOTAL $6.8 Million

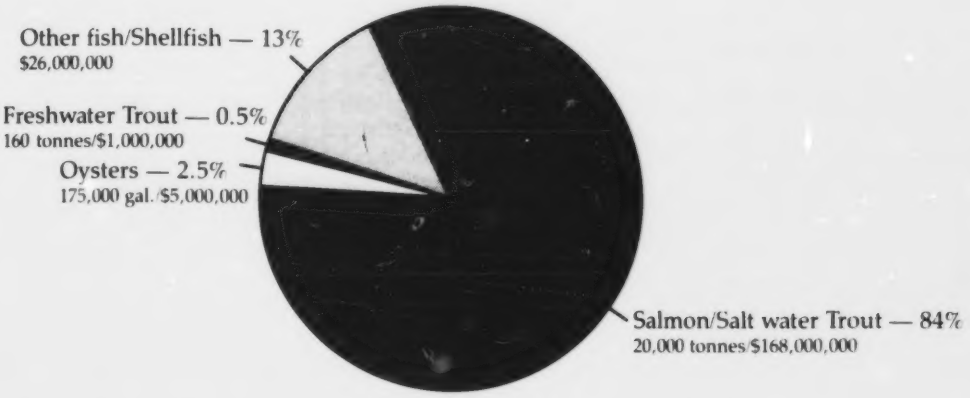


British Columbia

Projected Aquaculture Production

1990

TOTAL $200 Million



Salmonids

SALMON

Although a few fish farms in B.C. currently raise Atlantic salmon, most B.C. salmon farmers grow two Pacific species, Coho and Chinook. Pink, Chum, and Sockeye salmon are not candidates for aquaculture at this time. Understandably, fish farmers have to be familiar with the life cycle of wild salmon if they are to be successful in raising the same species in captivity.

In the wild, mature salmon spawn during the fall months in freshwater rivers and streams. The females release their eggs on the gravel stream bottoms, then the males fertilize the eggs with their milt and cover them with gravel. The adults die soon after spawning.

The fertilized eggs begin to incubate in the gravel, and depending on species and water temperature, the eggs normally hatch in January or February. The young salmon that develop from the eggs are called alevins. Each alevin has a large yolk sac attached to its body that provides it with nourishment. Once the sac has been absorbed, the alevin swims up from the gravel bed and becomes a free-swimming fry. This occurs between April and June.

Salmon fry remain in freshwater until they have developed a capacity to live in sea water. Once they reach that stage they are called smolts. Coho fry usually stay a full year in freshwater and reach a weight of 10 to 15 grams before entering salt water. Many Chinook fry only spend up to three months in freshwater and enter salt water in May or June when they weigh between 3 and 5 grams.

Once at sea, salmon spend the next several years growing to maturity. They then return to their home stream to spawn. Coho commonly mature after two years in salt water at a weight of 5–7 kilos (10–15 lbs.). Chinook take from three to six years to mature and can weigh as much as 35 kilos (80 lbs.). An average Chinook matures in four years at a weight of 7–10 kilos (15–20 lbs.).

THE EGG SUPPLY

As part of the federal-provincial Salmonid Enhancement Program, millions of young salmon are raised and returned to the sea annually by federal government hatcheries. At these hatcheries, female and male salmon swimming upstream to spawn are captured and stripped of their eggs and milt. The eggs are fertilized under controlled conditions, and a portion of these fertilized eggs are sold to commercial hatcheries for salmon farming. Some commercial hatcheries maintain their own broodstocks from which they take the eggs and fertilize them to raise smolts for aquaculture. This trend is increasing.

Eggs are only allocated to private fish farms once the needs of the wild stock fishery have been met. Coho eggs are in reasonably good supply for B.C. salmon farms from federal hatcheries, but the supply of Chinook eggs is more limited. The need for more eggs has resulted in a special federal-provincial project aimed at developing additional supplies of Chinook eggs from privately raised select broodstocks.

Over 40 million salmonid eggs were purchased by the aquaculture industry at a value of $2 million in 1986. In the future, private hatcheries will supply all eggs for the industry and will have developed strains of broodstock which are disease resistant and specially suited for commercial production in our local waters.

SALMON HATCHERIES

Raising salmon from eggs is a specialized operation requiring considerable skill and experience. Anyone planning a hatchery operation should visit one of the many government or commercial hatcheries currently operating in the province.

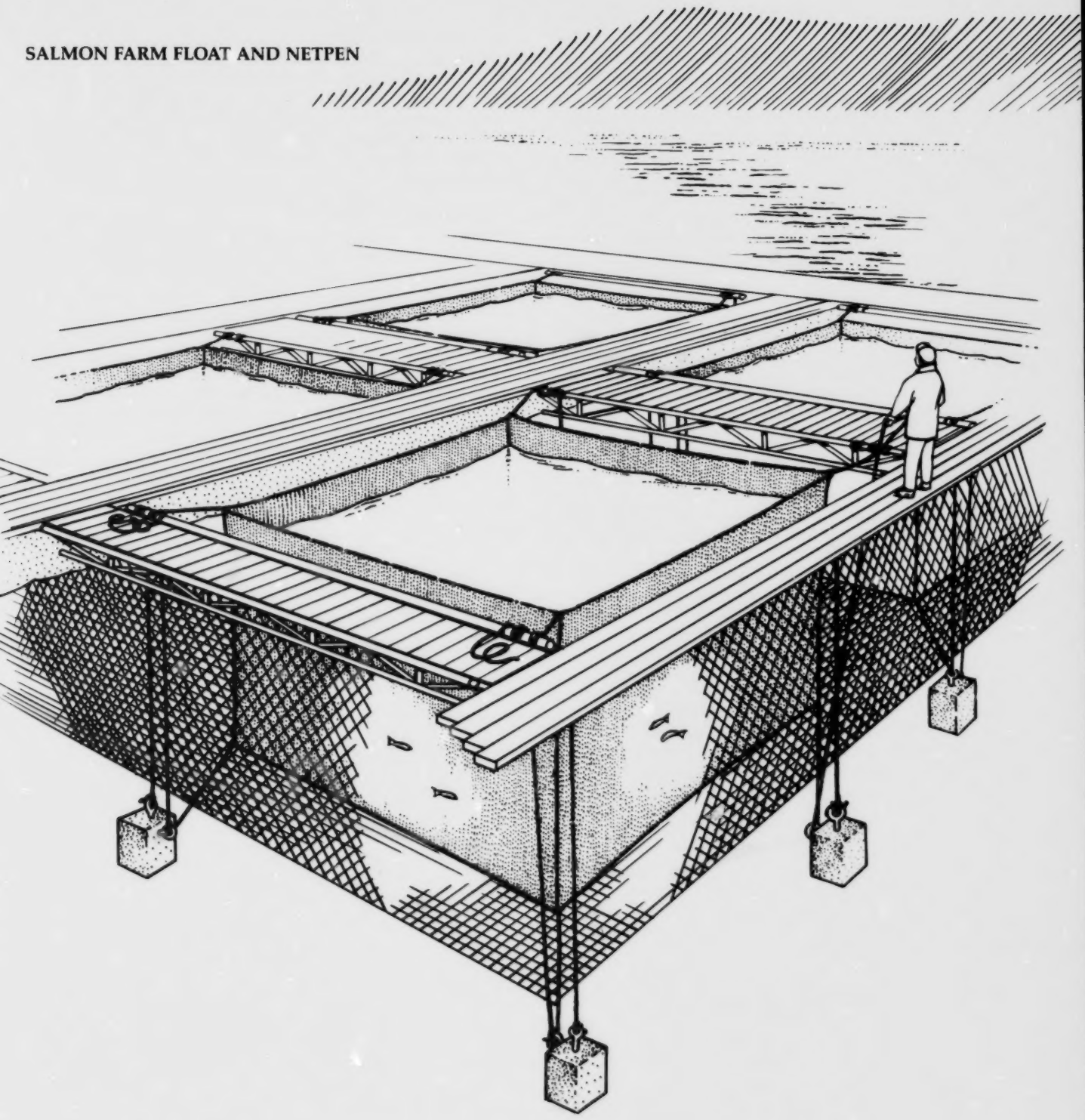
The main consideration in establishing a hatchery is a good supply of freshwater, preferably ground water from a spring or well. If the hatchery operator also plans to raise the salmon fry to maturity, the hatchery could be located close to salt water suitable for rearing salmon in netpens. The operator will also have to lease or purchase a land site suitable for his operation.

Besides water quality, temperature is another critical factor to consider when establishing a hatchery (10–15°C is ideal). The oxygen requirements of the young fish are such that all water in the hatchery should be well aerated.

The physical structure of a hatchery requires one or more buildings where the eggs are incubated in stacks of incubators through which fresh, aerated water is constantly circulating. (A stack of eight Heath trays will incubate approximately 40,000 eggs.)

Once the eggs hatch, the alevins are transferred to freshwater troughs or tanks usually located outdoors. The fry are then raised to the smolt stage, at which time they are transferred to salt water. Sometimes salt water is introduced into the freshwater tanks to prepare the fish for the final transition to the sea. Coho fry may be kept in freshwater tanks for up to a year; Chinook are kept in freshwater for approximately three months.

SALMON FARM FLOAT AND NETPEN



ESTABLISHING A SALMON FARM

As most salmon farms occupy aquatic Crown land (intertidal foreshore or tidal nearshore) assessing the public impact of a salmon farm is an important factor. To ensure orderly growth and development of the aquaculture industry, the B.C. government, at the request of coastal users, placed a temporary moratorium on all new fish farm applications. Beginning October 31, 1986, a public inquiry was held and 52 recommendations were put forward by the B.C. Finfish Aquaculture Inquiry. These recommendations were accepted by the B.C. Cabinet and the moratorium was lifted in most areas. By June 1987, 48 of the 52 recommendations were in place and studies concerning sensitive areas of the coast were complete. Some examples of new guidelines now in place and operating include:

- a Minister's Aquaculture Industry Advisory Council composed of 15 members from coastal user groups and industry
- increased distance between fish farms
- a mandatory environmental monitoring program
- increased rental charges and a review of bonding requirements for the use of Crown land
- a Crown land application referral system which provides suitable opportunities for local governments and other interest groups to participate in decision making.

The provincial government has an effective set of guidelines in place, and with the Ministry of Agriculture and Fisheries as lead agency, growth and development of the industry can be encouraged and yet meet the needs of other user groups.

The B.C. Salmon Farmers Association has developed, with the assistance of the provincial government, a Code of Practice which alerts all members to acceptable methods of salmon farming both from a regulatory and public viewpoint. This manual will be expanded further to provide extension material on all aspects of salmon farming.

Selecting the right site for a salmon farm is critical to its success. First of all, there must be reasonable tide movements to ensure that the water in the pen provides an adequate oxygen supply and that wastes are washed away. The water should be as clean as possible to start with, and the general area should be non-industrial to guard against water pollution in the future.

Water temperature is another major factor in site selection, and this should be carefully checked over a period of time before setting up an installation. The fish farm must be linked to suppliers by a reliable road or marine transportation, and it should have a consistent communications system for contact with suppliers and markets.

A fish farm requires a large work and storage area, which is usually established on the shore adjacent to the netpens. Some farms are totally water-based, consisting of large floating barges that contain all necessary work, storage and living areas.

A typical fish farm will consist of a number of floating walkways from which a number of netpens are hung in the water six metres or more deep. The sizes and shapes of the nets may vary, but the key consideration is ease of handling. Nets need to be pulled up and cleaned regularly, mainly because of the aquatic plants and animals that grow on the nets and impede the flow of oxygenated water to the fish. As the fish grow, nets with larger mesh are installed to increase the flow of oxygenated water through the pens. Predator nets should also be strung outside the netpens to prevent seals and other wildlife from preying on the salmon stock.

For the first year of operation, a new salmon farmer might undertake a pilot project. All aspects of the operation can be examined over that period, and the operator can benefit from early mistakes without suffering too great a financial loss. A fully operational fish farm can produce between 100 and 500 tonnes of fish annually. Several very large farms (1000 tonnes) are currently starting up. One entirely land based operation is also being considered.

OPERATING A SALMON FARM

Salmon farming requires a delicate touch and considerable know-how in raising living organisms. Even at that, survival rates among the stock sometimes can be discouragingly low. Fish in captivity are very susceptible to a number of diseases, and the stock must be carefully monitored at all times. The best time to view the fish and judge their vigour is during feeding periods. Sick or dying fish should be removed immediately.

Furunculosis, vibriosis, and kidney disease are three bacterial diseases that can devastate fish in netpens. Captive salmon can also suffer from tissue damage caused by high concentrations of certain kinds of plankton in the water, and deficiences in diet can contribute to sickness as well. Disease spreads quickly among fish, and if precautions are not taken, farm workers can easily transmit fish disease from one netpen to another. The very act of handling fish, such as moving them from one pen to another, causes stress in the fish and increases the risk of disease and mortality.

Recent breakthroughs in anti-bacterial vaccines means that salmon fry can be dipped or inoculated against certain diseases. Stringent sanitary conditions, including disinfecting all equipment, help prevent diseases from getting established on a fish farm. Minimizing the number of times fish are handled, and learning what conditions are best for fish handling, help reduce disease as well.

If farmed fish do show signs of illness, the fish farmer should be knowledgeable enough to make a reasonable diagnosis of the problem and begin treating it immediately. At the same time, the farmer should seek out assistance in diagnosis and treatment from the federal and provincial diagnostic services located at the Pacific Biological Station in Nanaimo and at the Veterinary Laboratory in Abbotsford, respectively. Experience to date indicates that Chinook can be more susceptible to disease on fish farms than Coho. Viral diseases are also a cause of mortality, and preventive measures are being sought.

THE MARKETS

Most salmon farms in B.C. specialize in the grow-out phase of rearing salmon. Acquiring smolts from a commercial hatchery, the salmon farmer raises salmon to market size in netpens in salt water.

One of the first salmon farms to operate in B.C. was an experimental farm established in 1973 by the federal Department of Fisheries and Oceans at its Pacific Biological Station in Nanaimo. It was here that much of the knowledge and expertise now employed in salmon farming in B.C. was first developed.

A few years ago, the main market for farmed salmon was for what is called pan-size salmon, a fish that weighs about 300 grams (11 oz.). This meant that the salmon were kept in salt water for approximately eight months before they reached market size.

There has always been a market for fish of a much larger size, but in the past the techniques for raising large salmon in captivity weren't well developed. Today, many salmon farmers raising Coho rear their salmon for a second year. At that point the fish average about 2.0 kilograms (4 lbs.). Salmon farmers looking for an even bigger fish to market are turning to Chinook, although Chinook can be more difficult to raise than Coho. Fish can be prevented from maturing too early by using sex sterilization techniques and thereby allowing the fish to attain a larger size. Reared in netpens for up to three years, Chinook can attain weights of 5 kilograms (11 lbs.) or more. Seventy per cent of the fish produced in B.C. is currently exported, mainly to the United States. Production is expected to increase rapidly, reaching 20,000 tonnes by 1990.

THE SALMON FARM BUSINESS

It is estimated that by the year 1990, salmon farming in B.C. will provide 3,500 jobs and yield an annual production with a wholesale value of $168 million. Current sales are up to $3 million, so it is clear that salmon farming in B.C. is continuing to expand rapidly.

Anyone interested in setting up a salmon farm first has to develop a sound management plan and a solid business plan. A Chinook farmer may not sell a fish for three or four years, so will require a considerable amount of capital to get started. It is estimated that a salmon farm with an annual production of 50–100 tonnes will require an investment of $500,000 or more, two-thirds of which is operating capital.

The success of a salmon farm venture depends on the operator's ability to find a steady market for farmed salmon. The speciality product is in demand by restaurants, fish markets, and other outlets that can retail fresh salmon at a premium price.

THE FUTURE

A fish farmer wants to grow as big a fish as possible, but is limited by the fact that wild stock salmon mature at a fixed weight according to a natural cycle. Researchers are actively looking into ways of increasing the size and quality of farmed fish.

Also, techniques have been developed to move Coho fry into saltwater netpens after only five months in their freshwater hatchery. It normally takes a Coho a full year to smolt (adapt to salt water), and this acceleration of the smolting process has allowed freshwater hatcheries to greatly reduce the cost of producing Coho fry.

In the future, further advances in fish research will provide fish farmers with a faster-growing, more domesticated salmon. As well, research is progressing in the fields of health and nutrition, and into developing improved strains of salmon to provide salmon farms with genetically superior stock.

TROUT

Rainbow trout is the primary species of fish raised on freshwater fish farms in British Columbia. Throughout the world, Rainbow trout have been selectively bred for generations. This has resulted in a domesticated fish with a rapid rate of growth, high resistence to disease, and a good tolerance to crowding.

Fresh trout is a high-value speciality food sold in restaurants and markets, and many B.C. trout farmers raise trout for food market sales. Some trout farmers are in the business of supplying growers with eggs or fingerlings. A third type of trout farmer runs a fish pond where anglers can pay to fish for trout virtually any time of year.

To avoid the possibility of diseased fish or undesirable fish species entering B.C.'s freshwater rivers and lakes, current regulations prohibit raising fish commercially in streams or lakes. Freshwater fish farms therefore must use large holding tanks or troughs on private land.

Rainbow trout are also grown in saltwater netpens. Having been domesticated for many generations, they may prove to be easier to raise than salmon.

OPERATING A TROUT FARM

Most B.C. trout farmers buy eggs or fry from established B.C. or U.S. trout farmers and raise the fish to maturity. The more established farms maintain a broodstock for egg production.

Trout farmers wishing to hatch and rear trout from eggs can utilize one of several commercially available incubators. Once the eggs hatch, the fish are transferred to fry-rearing troughs through which water must flow constantly. When the fry reach a suitable size they are moved to rearing ponds.

For ease of maintenance and good visibility, rearing ponds should be lined with plastic. The main structure could be wood, concrete, fibreglass or earthfill. Although unlined earthen ponds are less expensive to construct, they are more difficult to clean and disinfect. The deepest trout ponds do not exceed four metres, and one to two metres is sufficient if the water is fast-flowing. A pond with wind exposure should experience good water circulation.

Water supply for fish ponds generally comes from springs, wells, streams and lakes. The water should be clean and contain a good supply of oxygen. The water temperature should not exceed 20°C. In some cases it may be necessary to heat and aerate the water to promote healthy, fast-growing fish.

Guarding against disease, infection and parasites is a critical part of fish farming. Reasonable stocking densities, minimal handling, a good diet, and careful monitoring of the stock all contribute to reducing fish mortalities. When problems do occur they should be treated swiftly. Disinfecting a diseased trough or pond is essential to prevent further spread of disease. Assistance in disease diagnosis and treatment is available from the provincial and federal diagnostic service at the Veterinary Laboratory in Abbotsford and at the Pacific Biological Station in Nanaimo, respectively.

THE BUSINESS OF TROUT FARMS

There are approximately 154 commercial trout farms in British Columbia. (This figure does not include those individuals who raise trout in private fish ponds for personal use.) The vast majority of B.C.'s commercial trout farms are small operations and do not represent the operator's main source of income.

B.C. trout farmers currently do not meet local demand for farmed trout. Fifty per cent of all trout consumed in B.C. is imported from the U.S.A. Another 7 per cent is imported from Japan. Also, it has been estimated that the sale of B.C. trout in western Canada could double from 80 tonnes in 1984 to 160 tonnes in 1990.

In light of these market conditions, trout farming in British Columbia could be in a position to enter a period of expansion — if products could be produced and sold at competitive prices. At the moment, however, the selling price of imported trout from the U.S.A. is reported to be lower than the cost of production for some B.C. trout farmers.

Oysters

Although the Eastern, European and Olympic oysters occur in British Columbia waters, the only species of oyster commonly cultivated in the province is the Japanese, or Pacific, oyster. First introduced into B.C. in 1912 to replenish the dwindling stock of natural Olympic oysters, the Pacific oyster today is at the centre of an oyster farming industry valued at $3 million annually.

THE LIFE CYCLE OF OYSTERS

Wild oysters occur mostly in the protected bays and inlets of the Strait of Georgia. Considerable oyster populations are found in Pendrell Sound and Pipestem Inlet where water conditions favour annual spawning.

Oysters begin maturing in the spring when water temperatures begin to rise. They are sexually mature by the middle of July. At the time of spawning, the male and female oysters discharge their sexual products into surrounding waters where fertilization takes place.

Soon the young oyster, or larva, is able to swim about and begins to grow. Within 20 days the larva has developed most of its adult properties, but it is still too small to be seen by the naked eye. (It is estimated that 2.5 million of these larvae have the approximate volume of a golf ball.) Swept along by the ocean currents, the larva eventually settles on a solid object such as a rock. It then cements itself to that object for life.

The process of becoming attached to a solid object is called setting. The tiny oyster at this point is called spat or seed. The object to which it is attached is called cultch. As the oyster matures, the portion attached to the cultch will grow to conform with the contours of the cultch. Oysters grown on soft mud or in clusters take a long and narrow shape. Oysters grown on hard ground in the lower intertidal area have a round, deep shape, often with extensive shell fluting.

The length of time it takes for an oyster to mature varies according to water temperature and the availability of food. A fast-growing oyster may be large enough to spawn the first summer after spatting. Oysters can only grow appreciably when water temperatures are 9°C or warmer. Oysters grown on intertidal beaches usually take three to four years to reach marketable size.

SEED COLLECTION

Many of B.C.'s oyster farms grow their oysters from spat collected at Pendrell Sound and Pipestem Inlet. Every year oyster seed collectors gather in their boats and barges to await the period following oyster spawning when the tiny, free-swimming larvae are ready to attach themselves to cultch.

The operators then lower cultch material into the water in the expectation that the larvae will attach themselves to it. Cultch materials commonly consist of oyster shells, cement chips or plastic tubes. After the larvae have attached to or "set" on the cultch, the oyster farmer allows it to grow until the fall before moving it to storage or grow-out sites. Setting may continue over several weeks. The set cultch is now called "seed" and may be used by the farmer who collected it, or sold to other oyster growers.

Depending on a wide range of environmental or business circumstances, the annual oyster seed collection can be ample or minimal. That, in turn, has an effect on the entire oyster industry.

HATCHERIES AND REMOTE SETTING

To avoid the unpredictability of collecting seed in the wild, oyster farmers are beginning to look to oyster hatcheries for their annual supply of oyster seed.

B.C.'s two oyster hatcheries maintain oyster broodstock in special tanks. Through manipulation of the water temperature, the oysters can be induced to spawn. The resulting fertilized larvae are moved to larger tanks where they continue to grow for three weeks in warm water on a nutrient-rich algae diet. By then they are developed enough to set on cultch.

The larvae are removed from the tank and transported in containers to an oyster farm where the grower has prepared a holding tank containing cultch, usually aged and cleaned oyster shells or plastic tubes. The larvae are put into the warm-water tank where they adhere to the cultch. The tiny oysters are kept in the tank for up to a week to ensure that they are well attached.

This method of producing oyster seed is known as remote setting. When the process is completed, the cultch is removed from the tank and put in the ocean where the oyster can grow to market size.

In addition to its ability to provide spat on a dependable basis, the remote setting process also allows growers to begin raising oysters early in the summer, rather than waiting for the spat supply from Pendrell Sound and Pipestem Inlet late in July. This can reduce the time it takes to raise an oyster to market size by a full year.

BOTTOM CULTURE

The most common and least expensive method of growing oysters consists of spreading cultch on the intertidal ocean bottom. The oysters will flourish here as long as there is a good flow of pollution-free, nutrient-rich water. Oysters grown in this way take four years to reach market size.

A firm bottom of fine gravel or sand is the ideal environment for bottom culture. The area should also be protected from excessive wave action which might wash the oysters too high onto the beach. Oysters on the ocean bottom are subject to various predators, including crabs, oyster drills and starfish.

Bottom culture oysters are harvested by hand at low tide. The harvested oysters are then washed, shucked, packed, refrigerated, and shipped fresh or frozen to restaurants or seafood markets.

In locations where the ocean bottom is too soft or muddy, techniques have been devised to keep the oysters off the ocean floor. A series of individual stakes with cultch attached and driven into the intertidal mud provides oysters with a place to grow, as do racks constructed in intertidal zones with strings of oyster cultch suspended from the rack frames. Methods such as these constitute near-bottom oyster culture.

Near-bottom methods promote better oyster growth than bottom culture, and the oysters reach marketable size in three years instead of four. However, near-bottom methods require considerably more labour and materials, and this can make near-bottom culture less cost effective overall.

OFF-BOTTOM CULTURE

The British Columbia coastline has a limited number of sites that are suitable for bottom or near-bottom oyster culture. However, it is also possible to practise off-bottom culture, which consists of growing oysters entirely in the waters of the subtidal zone.

Off-bottom methods depend on floating ocean structures from which oyster cultch is suspended in the ocean. The floating structure may be a raft, a log float, or synthetic floats linked by ropes. Oysters grown by off-bottom methods are out of reach of predators on the ocean floor and grow to a marketable size in two years or less. They are usually fatter and more uniform in size than those raised on the ocean bottom.

The most common off-bottom method is called the deep water longline method. Long vertical, synthetic lines to which oyster cultch is attached are suspended from a horizontal mainline suspended at the water surface by floats. The lines are left in place for the two years it takes the oysters to mature. Come harvest time, the floating platform is moved into intertidal waters, the lines are released, and the oysters are collected off the exposed beach at low tide. Another harvesting method is to lift the heavy lines right out of the water with a derrick on a raft or scow.

The highest quality oysters are produced by the tray method of off-bottom culture. Instead of vertical grow out strings, sets of plastic trays filled with oyster spat are suspended from the longline. Single oysters used for this method grow into well-shaped, deep-cupped oysters about 9 cm. long weighing about 75 grams. This method often requires considerable maintenance, as the trays need to be cleaned and the oysters thinned on a regular basis. The final product is often sold as a specialty food served on the half shell.

THE OYSTER BUSINESS

Oyster farming in B.C. very often has been run as a family style business, with bottom culture being almost the only method employed. Expansion in the industry has been limited, as most good bottom sites already have been leased. However, off-bottom culture methods are less dependent on the characteristics of the foreshore ocean bottom, and they offer considerable opportunity for the development of oyster farming in the province.

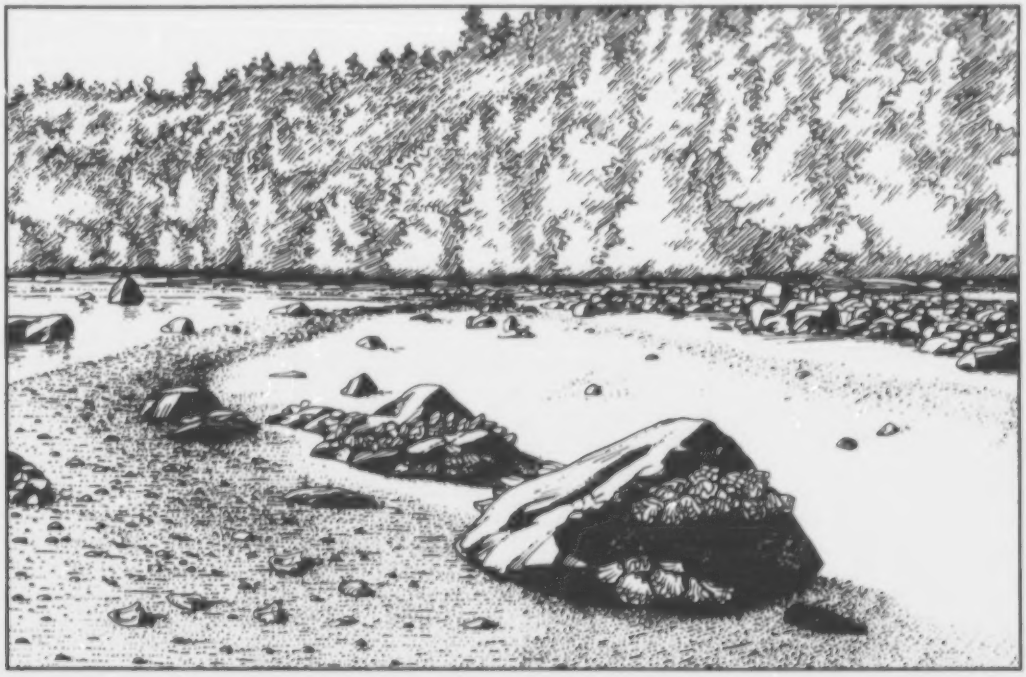
Off-bottom methods are more costly and require more intensive management than bottom or near-bottom methods, but they yield greater volumes of quality oysters in much less time. In fact, when combined with remote setting, off-bottom culture can produce premium oysters in less than 18 months. Bottom culture takes four years to produce a marketable product.

As of June 1987, 220 oyster growers are producing 90,000 gallons (U.S.) of oysters from slightly more than 1,600 hectares of foreshore leases. More intensive off-bottom culture techniques could produce much higher volumes, and secondary processing (canning, freezing) at the farm site could further increase gross revenues. The demand for increased oyster production in B.C. is clearly shown by the fact that over $6-million worth of fresh, frozen, and canned oysters are imported into Canada annually through B.C. ports, mainly from the U.S. and Korea.

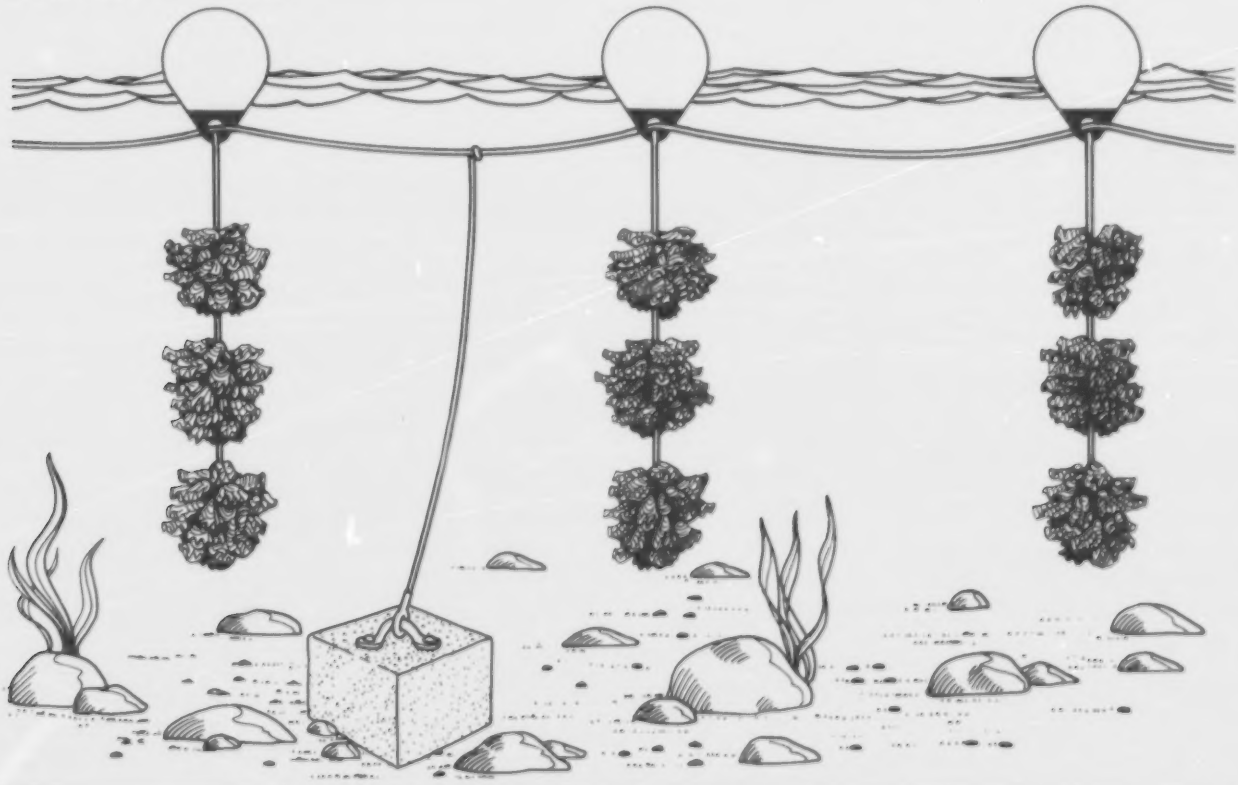
Getting started in the oyster business could require an investment of $150,000, although the small, family style operation can be initiated for considerably less. In the future, growers will utilize advanced rearing techniques (such as remote setting and genetic manipulation) to grow oysters tailor-made for specific markets.

Within the province, the marketing of oysters and related activities is regulated by the British Columbia Oyster Marketing Board. The role of the board is described in chapter five.

BOTTOM OR BEACH OYSTER CULTURE



LONGLINE OYSTER CULTURE



The Role of Government

As with traditional farming, the aquaculture business requires a considerable investment of time and money, and the aquaculturist must secure markets for the food produced.

Both the provincial and federal governments recognize the vast potential and concurrent risk associated with the aquaculture industry in British Columbia. A wide range of programs are available to assist the aquaculturist and to encourage the development of the industry.

PROVINCIAL GOVERNMENT

The Ministry of Agriculture and Fisheries has been identified as the lead agency provincially to develop aquaculture into an important food-producing enterprise in British Columbia. Its role focuses on the development of provincial policy and the coordination of programs offered by various agencies. Finfish and shellfish are the major sectors serviced with some support given to other groups such as marine plants.

As lead agency, the ministry plays an important role as the working contact for the prospective aquaculturist. Staff provide information and assistance on the preparation of aquaculture development plans and lease applications. The ministry is responsible for direct delivery of programs such as

- knowledge development and transfer (particularly extension and applied research)
- market promotion and development
- product development
- fish health (veterinary) services
- limited financial assistance through existing programs which are available to all farmers in British Columbia.

Marine aquaculture operations involve access to aquatic Crown land (intertidal foreshore or tidal near shore). This requires securing an aquatic land lease or licence from the Ministry of Forests and Lands. Financial assistance and counselling related to the business of aquaculture is available from the Ministry of Economic Development.

FEDERAL GOVERNMENT

The federal Department of Fisheries and Oceans has, as its primary role, the management of wildstock marine fisheries. But it has also made important contributions to aquaculture, especially in the field of fish science. The Pacific Biological Station in Nanaimo is the department's headquarters for research on the west coast.

Researchers at the station carry out studies in fish and shellfish culture, fish health, nutrition, and genetics. Based on this work, the federal government provides a range of services to aquaculture operators. These include providing advice on diet and nutrition for salmon, providing advice on husbandry practices, and providing disease control through vaccination.

The Pacific Biological Station is also investigating the possibilities of new aquaculture enterprises, and currently scallops, Atlantic salmon, mussels and sablefish (black cod) are being studied for their potential as farm stock.

An important federal-provincial responsibility is the Salmonid Enhancement Program (SEP). Established in the middle 1970's, SEP was designed to enhance the wildstock fishery through habitat improvement and the establishment of hatcheries to increase the survival rate of smolts. These federal hatcheries have been a key source of eggs for the aquaculture industry. In the long term, however, it is expected that the private sector will assume responsibility for the production and distribution of all eggs used in salmon farming.

Disease diagnostic services for both government and private fish and shellfish culture are provided through the Department of Fisheries and Oceans in cooperation with the provincial ministries of Environment and Parks and Agriculture and Fisheries.

OTHER PROGRAMS

To help ease the shortage of Chinook eggs available to salmon farmers, the Salmon Broodstock Program was established as a joint project of the salmon farming industry and the provincial and federal governments. Initiated in consultation with the Salmon Farmers Association, it is designed to increase the industry's supply of Chinook eggs through the raising of broodstock on private salmon farms. The program will also improve the genetic quality of salmon broodstock, and help develop techniques for handling eggs and smolt production on a commercial scale.

This program of generating egg supplies from private operators will reduce the dependency of private salmon farmers on wild fish stocks. It will also reduce the fluctuations in egg supplies that result from the natural cycles of wild stocks.

The Salmon Broodstock Program, funded by the Ministry of Agriculture and Fisheries, includes selected broodstock testing, feeding regime testing, and the expansion of egg production. The egg production goal for 1987 is six million eggs; for 1988 the target is 20 million eggs. B.C. Research of Vancouver has been contracted to provide the technical supervision for the program.

The first phases of the program are nearing completion and the following phases will include actual genetic selection of tested species of wild fish stocks proven to be hardy.

Other shellfish projects include field testing remote setting techniques and the oyster spatfall prediction service, which identifies the conditions and locations where oysters spawn each year. This allows oyster seed collectors to be at the right place at the right time to make their annual collection of wild oyster seed. Once a service of both the federal and provincial governments, today the service is provided by a private firm under contract to the provincial government.

EDUCATIONAL SERVICES

Educational training related to aquaculture is available from various sources. Malaspina College in Nanaimo offers a full 2-year aquaculture program, and it also offers separate aquaculture extension courses. The B.C. Institute of Technology in Vancouver provides courses on wild fish management, and School District 46 in Sechelt offers a comprehensive extension program in aquaculture. In cooperation with School District 46, North Island College in Campbell River also offers an extension program in aquaculture. The University of Victoria and Simon Fraser University normally offer an aquaculture course, and an Aquaculture Resource Centre is in place at the Sechelt campus of Capilano College. The Bio-Resource Engineering Department of the University of British Columbia offers a course in aquaculture engineering. The provincial government has, through a consultant's report, assessed the state of aquaculture education services offered in the province. Integration and organization of these courses is being planned for the near future.

FINANCIAL ASSISTANCE: AN OVERVIEW

In aquaculture, the researcher, producer, processor, marketing agent, along with related service industries, are all eligible for assistance under a wide variety of government programs. These may include interest-free or low interest loans, sales tax exemptions, loan guarantees, and funds for specific purposes.

Federal and provincial financial assistance programs pertaining to the aquaculture industry are outlined in chapter six.

Operating the Farm

Aquaculture is an expanding business in British Columbia, and although setting up a new operation is an involved process, there are experienced producers, suppliers, and consultants who can help a prospective aquaculturist become established in the industry. Assistance is also available from several government departments.

As part of the procedure for starting up an operation, an aquaculturist must obtain a number of federal, provincial, and municipal permits and licences. The documentation process appears complex, but it is both logical and essential. The regulations governing aquaculture are designed to provide optimum operating conditions for aquaculturists, thereby ensuring the success of the industry.

However, it has to be recognized that applications for aquaculture installations may have to be balanced against competing resource uses such as forestry and recreation. Also, aquaculture operations can't interfere in any way with the wildstock fishery.

Locating the operation at a suitable site and securing the necessary financing are fundamental prerequisites to getting started in the aquaculture business. As a result, governments require an operator to provide carefully researched documentation on the aquatic site selected, and develop an aquaculture development plan.

Completing background research and complying with the regulatory requirements takes time and patience, and the process can run from several months to a year. For initial information and guidance, the prospective aquaculturist should contact the Aquaculture and Commercial Fisheries Branch, Ministry of Agriculture and Fisheries.

AQUACULTURE DOCUMENTATION

COMMON REQUIREMENTS

An aquaculture operation requires a municipal or provincial business licence. As well, siting the operation must conform with any municipal zoning regulations. The operation should also be registered with the provincial Registrar of Companies, Ministry of Finance and Corporate Relations. This registration protects the company name, and is required if the business is operating under any name other than a person's given name.

If fish are to be transported further than 50 kilometres from a hatchery, the operator requires approval from the joint federal-provincial Transplant Committee. This attempts to ensure that the movement of cultured fish from one site to another will not endanger the health of wild fish stock.

Fish farms may also require a Pollution Control Permit from the Waste Management Branch of the Ministry of Environment and Parks. This permit certifies that any effluent water will not be harmful to the environment and will be inherent with the approved development plan.

The prospective aquaculturist may require a federal Aquaculture Permit from the Department of Fisheries and Oceans. This permit usually isn't issued until all other documentation is in place.

A prospective aquaculturist should apply for all relevant permits at the same time and as soon as possible. This will avoid any possible delays in the start-up of the operation.

BUSINESS PLAN

Farming of any description requires good business planning as well as good farm management. A business plan is particularly necessary when applying for loans or other forms of financial assistance from either private or government sources. The Ministry of Economic Development offers free business counselling on how to prepare a business plan. In addition, many Chambers of Commerce throughout the province carry provincial government information to help business people.

AQUATIC LAND LEASE/LICENCE

In British Columbia, all tidal beaches and the adjacent ocean floor (near shore) are publicly owned Crown lands. To gain access to these sites to grow fish or shellfish, the prospective salmon or oyster farmer must apply for an aquatic land lease or licence from the Ministry of Forests and Lands. The prospective aquaculturist should contact their regional office of the Ministry of Forests and Lands with respect to the availability of the desired lease or licence before beginning to draft an aquaculture development plan. The plan, which details how the aquaculture enterprise will be run, ensures that the prospective aquaculturist has a thorough understanding of the work ahead of him. This in turn ensures that the Crown resource, both land and aquatic, will be put to beneficial use with a minimum of conflict with other resource users. The prospective operator can submit an application for an Investigative Permit which will hold a site for up to a maximum of one year. During this time, no development is allowed but studies on site feasibility can be completed. Following the successful completion of an aquaculture development plan, the operator may be granted a long-term lease covering a designated aquatic land area. A separate licence is granted where short-term tenure is required for such things as experimental work or storage.

Under the terms of the lease/licence, the operator pays rent for exclusive use of Crown land. For shellfish operations, rental is determined by the land value of the site based on the productivity rating for aquaculture used by the B.C. Assessment Authority. This system is currently under review. For finfish operations, rental is determined using a flat rent rate per hectare based on a zone value. There are currently five zones along the coast of British Columbia. Zones are divided on the basis of access of farms to markets, intensity of competing uses in the zones and amount of tenure application activity. Rental discounts for the first three years of operation are 60 per cent of full rental value. Investigative Permits have a set fee. Prices for all Crown foreshore will be reviewed periodically.

The operator may also need to own or lease at least a small portion of land above the tide line to allow access to the water.

OTHER REQUIREMENTS

To rear fish in freshwater in British Columbia, either in a hatchery or on a trout farm, an aquaculturist requires a Commercial Fish Culture Permit from the Fisheries Branch of the Ministry of Environment and Parks. This permit indicates that the operator is registered and allowed to conduct commercial, freshwater fish farming operations.

An operator may also require a Water Licence from the Water Management Branch of the Ministry of Environment and Parks. A Water Licence is required if the aquaculturist plans to withdraw water from a lake, river, or stream. The licence establishes the operator's priority regarding access to a specified volume of freshwater.

In trout farming, if fingerlings or eggs are brought in from outside the province, a special Import Permit is required from the Fisheries Branch.

If trout are to be transferred from a hatchery to salt water for the final grow-out phase, the regulatory requirements are the same as for marine salmon aquaculture.

In marine aquaculture, an operation established in navigable waters must obtain a federal navigation compliance from Transport Canada to ensure that the operation will not interfere with navigation.

Anyone who owns or operates an oyster lease of one acre or more is required by legislation to register with the B.C. Oyster Marketing Board. Oyster growers must also register with the Aquaculture and Commercial Fisheries Branch of the Ministry of Agriculture and Fisheries.

PROCESSING OF AQUACULTURE PRODUCTS

Any processing of marine products in B.C. requires a provincial Processing Licence. In most cases, any processing of marine products will also require federal registration. The provincial government inspects facilities and the federal government examines products destined for export and tests for PSP (paralytic shellfish poison) in all bivalves. The following are specific examples:

Where fish are processed beyond the bleeding stage, all facilities must have a fish Processing Plant Licence obtained from the Aquaculture and Commercial Fisheries Branch. Shellfish can be processed with an Invertebrate Processing Licence, also obtained by the Aquaculture and Commercial Fisheries Branch.

For public health reasons, oysters cannot be marketed until they have been processed by a federally-registered processing facility. A grower without a licensed processing plant must arrange to have his oysters processed through such a facility.

If fish and shellfish are to be exported, the federal Department of Fisheries and Oceans requires that the operator obtain a Fish Processing Registration Certificate. Inspection by the department is required for the export of all fish and shellfish products. Shellfish exporters must be registered on the Interstate Certified Shellfish Shippers' List.

MARKETING

Fundamental to the success of any aquaculture enterprise is a well-developed and realistic marketing strategy. It should capitalize on the built-in advantage of aquaculture, which is the ability to provide customers with a regular supply of high quality fresh fish and shellfish of a uniform size.

Most aquaculturists, especially smaller operators, commonly market their products to fish and shellfish wholesalers who in turn supply retail outlets and restaurants. Some aquaculturists are able to sell their products directly to the consumer, but small-scale direct consumer sales normally are not worth the operators' added effort and expense.

Marketing fish and shellfish is a competitive business, and experienced aquaculturists have developed successful marketing strategies unique to their own operations. A newcomer to the business needs to gain practical marketing experience, and the best way to begin is to carefully analyze the price structure of the product being marketed. Earning a reputation for carefully handling stock and being reliable and prompt in meeting delivery requirements is critical to long-term marketing success.

Oyster growing is the oldest form of aquaculture practised in the province, and over the years the growers have recognized the advantages of a collective approach to marketing. Today, all commercial oyster growers and wholesalers are registered with the B.C. Oyster Marketing Board, which helps to regulate the supply of oysters and to maintain the quality of the stock. Most importantly, the board sets a minimum selling price for oysters. This minimum price helps bring stability to a sometimes volatile market.

The Ministry of Agriculture and Fisheries, Marketing Branch, can assist the new farmer with any questions. Associations listed at the end of this booklet are contacts for product development.

There is no B.C. salmon or trout marketing board to regulate the marketing of salmonids. Before undertaking a major investment in aquaculture, prospective fish farmers should ensure that they have a steady demand for their products at a reasonable price. Exploiting new markets is an important marketing technique, and B.C. salmon farmers currently are being very innovative as they look for new and better ways to tap into the large international demand for farmed salmon.

A vital factor to consider in marketing fish and shellfish is the fact that these are living organisms. They can only be marketed once they reach an appropriate size and weight, and then they have to be processed expertly and moved swiftly to their final market destination.

Experienced aquaculturalists caution that the farming of fish and shellfish as a business venture involves uncertainty, both in the economics of the operation and in the survival of the farmed stock to market size. An investment in aquaculture should be viewed as a long-term business commitment.

Aquaculture Documentation

SALMON	MUNICIPAL	PROVINCIAL	FEDERAL
Zoning Compliance	•		
Business Licence	•		
Registration — Registrar of Companies		•	
Aquaculture Development Plan		•	
Business Plan		•	
Transplant Approval — Fisheries Branch; D.F.O.		•	•
Aquatic Land Lease — Ministry of Forests and Lands		•	
Pollution Control Permit — Waste Management Branch		•	
Navigation Compliance — Transport Canada			•
Water Licence — Water Management Branch (hatcheries)		•	
Commercial Fish Culture Permit —Fisheries Br. (hatcheries)		•	
Aquaculture Permit — Dept. of Fisheries and Oceans			•

OYSTERS	MUNICIPAL	PROVINCIAL	FEDERAL
Zoning Compliance	•		
Business Licence	•		
Aquaculture Development Plan		•	
Business Plan		•	
Registration — Registrar of Companies		•	
Registration — Aquaculture and Commercial Fisheries Branch		•	
Registration — B.C. Oyster Board		•	
Transplant Approval — Fisheries Branch; D.F.O.		•	•
Aquatic Land Lease — Ministry of Forests and Lands		•	
Pollution Control Permit — Waste Management Branch		•	
Navigation Compliance —Transport Canada			•

TROUT	MUNICIPAL	PROVINCIAL	FEDERAL
Zoning Compliance	•		
Business Licence	•		
Registration — Registrar of Companies		•	
Business Plan		•	
Transplant Approval — Fisheries Branch; D.F.O.		•	•
Water Licence — Water Management Branch		•	
Pollution Control Permit — Waste Management Branch		•	
Commercial Fish Culture Permit —Fisheries Branch		•	
Import Permit — Fisheries Branch		•	

Financial Assistance Programs

The key source of financing for aquaculture operations is the money the prospective aquaculturist can raise through personal commitments and loans from commercial institutions. Another important opportunity for raising money for an aquaculture operation is venture capital from equity investors.

Although this chapter will discuss other potential sources of funding for aquaculture operations, the primary responsibility for successful funding rests with the prospective aquaculturist. The sources for all necessary funding should be secured before an operation is started.

GOVERNMENT PROGRAMS TO ASSIST ENTREPRENEURS

Government and related agencies recognize how much it costs to set up a small business. To help entrepreneurs, governments provide several programs of financial assistance. These include interest-free or low interest loans, sales tax exemptions, and loan guarantees. These incentives are designed to encourage entrepreneurs to become involved in such challenging and high-risk business opportunities as aquaculture.

Some programs provide funding for research and development. Several programs are designed to assist the producer with costs related to primary production. Some programs provide working capital for the producer. Funding is also available for the processing of aquaculture products to assist in getting them to market. Entrepreneurs who are in business to service the aquaculture industry are themselves eligible for assistance from the government.

The two key provincial ministries providing financial assistance to aquaculturists are the Ministry of Economic Development and the Ministry of Agriculture and Fisheries.

MINISTRY OF ECONOMIC DEVELOPMENT

The Ministry of Economic Development manages three programs of interest to the aquaculturist: The Small Business Venture Capital Program, the Aquaculture Incentive Program and the Small Manufacturers' Incentive Program.

1. THE SMALL BUSINESS VENTURE CAPITAL PROGRAM

Aquaculture ventures qualify for private funding raised by means of the Small Business Venture Capital Program. Under this program, corporate and individual investors will receive provincial tax credits against provincial income tax if they invest in a Venture Capital Corporation (VCC). The VCC, in turn, may invest in an aquaculture operator. The Small Business Venture Capital Program can provide assistance to all levels of the aquaculture industry, from research and development through to production and secondary processing.

2. AQUACULTURE INCENTIVE PROGRAM

Five-year, interest-free repayable loans of up to $100,000 for capital facilities to start up or expand aquaculture installations are available through the Aquaculture Incentive Program (AIP). The program is funded jointly by the federal Department of Regional Industrial Expansion and the provincial Ministry of Economic Development. This program specifically addresses the cultivation and harvesting of finfish, shellfish and aquatic plants.

3. SMALL MANUFACTURERS' INCENTIVE PROGRAM

Three-year, interest-free repayable loans of up to $50,000 for the modernization or expansion of firms engaged in the manufacturing, processing and advanced technology industries are available through the Small Manufacturers' Incentive Program (SMIP). The program is funded jointly by the federal Department of Regional Industrial Expansion and the provincial Ministry of Economic Development. Eligible firms are those involved with export, or with the increased utilization of domestic resources.

In addition to these programs, the Ministry of Economic Development offers business counselling services, and provides a variety of publications on the start-up and operation of a business, the preparation of a business plan, and the preparation of cash flow statements. The publications are available from the ministry's offices and at many Chamber of Commerce offices or local Economic Development Commissions.

MINISTRY OF AGRICULTURE AND FISHERIES

The Ministry of Agriculture and Fisheries offers several programs to assist the aquaculturist. These include the Guaranteed Loan Program and long-term loans through the *Agriculture Land Development Act*. A new program of interest to both producers and processors is the Food Industry Development Program.

To be eligible for assistance from the programs offered under the *Agriculture Credit Act*, the assistance must be for an operation that is owner-operated, and there is a limit on the allowable amont of off-farm income. For a family, corporate or partnership operation, the maximum allowable off-farm income is $50,000. For more information on eligibility, refer to the *Agricultural Credit Act*.

1. GUARANTEED LOAN PROGRAM

The Guaranteed Loan Program, made available under the *Agricultural Credit Act*, is designed to increase the availability of credit to viable farm operations (excluding public corporations) through chartered banks and credit unions. For this type of assistance, the bank applies on behalf of the applicant. The program assists viable operations that are unable to obtain a loan unless it is guaranteed.

These guarantees will be made available primarily for operating loans. The maximum loan to any one enterprise that may be guaranteed by the province is $300,000. The main criterion for such a loan guarantee is the projected capability of the enterprise to repay the loan over a reasonable period of time.

2. LONG-TERM LOANS

Through the Agricultural Land Development Assistance (ALDA) program, the Ministry of Agriculture and Fisheries manages a program to provide low-cost, long-term loans to operators to make permanent improvements to owned farmland. These loans might apply to aquaculture in areas such as farm road construction, well drilling, dam construction (with Ministry of Environment and Parks approval), land clearing and levelling, water storage reservoirs, and water pumping and conveyance systems.

Total loans outstanding at any one time to any operator may not exceed $50,000. The loan must be repaid over a 15-year period at a fixed rate of interest equal to one-half the prime interest rate at the beginning of the loan.

3. THE FOOD INDUSTRY DEVELOPMENT PROGRAM

(An applicant cannot receive or apply for assistance from another similar program for the same project costs.)

The Food Industry Development Program is managed by the Agricultural Finance Branch. It is designed to assist in the development and expansion of the food processing sector by increasing the use of British Columbia produce and food by the food service industry. The program offers grants of up to 50 per cent of eligible costs to a maximum of $50,000. The grants can be used for food product and market development, and processing technology.

OTHER AGENCIES

Other government agencies providing financial assistance include the B.C. Development Corporation, the Science Council of British Columbia, the Farm Credit Corporation, the Federal Business Development Bank, and various federal government departments.

1. THE B.C. DEVELOPMENT CORPORATION (BCDC)

This agency provides low-interest and conventional loans which may be half of the full BCDC prime rate. The loans are for capital costs related to the establishment or expansion of processing or manufacturing facilities.

2. THE SCIENCE COUNCIL OF BRITISH COLUMBIA

Under the Research Assistance Program and the Graduate Research Engineering Technology program, the council provides grants for direct employment subsidies for scientific research and technology transfer assistance.

3. THE FARM CREDIT CORPORATION

Under the *Farm Credit Act*, the corporation provides long-term mortgage credit for primary production and related secondary processing. These loans must be secured by first mortgages on owned farmland. The mortgages are for a term of 30 years at a fixed interest rate. The maximum loan for an individual is $300,000, and for a corporation, $600,000.

4. THE FEDERAL BUSINESS DEVELOPMENT BANK (FBDB)

The FBDB provides conventional bank loans, direct equity investment, and venture capital through equity matchmaking. This financial assistance can be used for both primary production and secondary processing. In addition, the FBDB provides a range of other services for business people, including business seminars and counselling.

5. OTHER FEDERAL ASSISTANCE PROGRAMS

Through the Industrial Regional Development Program and the *Small Business Loans Act*, the Department of Regional Industrial Expansion provides some grants and loans for secondary processing in designated areas. They also provide grants to assist Native Peoples' projects. Grants can be for 100 per cent of eligible research and primary production costs, and up to 50 per cent for the first year's eligible operating costs and for eligible secondary processing costs.

The Department of Indian and Northern Affairs is assisting in the early stages of Native Indian aquaculture programs.

There are other federal programs that might assist aquaculturists. For further information, refer to the information material produced by the Pacific Biological Station in Nanaimo, or contact the Canada Service Bureau.

HOW TO APPLY

For further information on financial assistance programs and how to apply, contact the agency responsible for the program(s) in which you are interested. A complete list of addresses and telephone numbers is included in the following chapter.

SALES TAX EXEMPTIONS

Exempted from the social services tax is a series of items which can be purchased for use in the aquaculture industry. The exemptions are similar to those allowed the fishing and farming industries.

A producer can obtain a form from the Ministry of Finance and Corporate Relations which the Aquaculture and Commercial Fisheries Branch can certify validating current or proposed production in excess of $7,500 annually. With this signed form, a working aquaculturist can complete a certificate of exemption permitting the tax-free purchase of a range of goods:

- seed collectors, seed bivalves, eggs, smolts and fry
- netting for cages and pens
- fish feed
- egg incubators
- fish tanks
- water filters
- rope, chain and cable
- automatic feeders
- temperature and salinity meters

Aquaculturists may also apply for a rebate of the social services tax paid for the purchase or lease of boats under 11 metres, and for motors and component parts used solely for aquaculture purposes. These exemptions are listed in full in the Consumer Taxation Branch Bulletin 50–85, available from the provincial Ministry of Finance and Corporate Relations. Under certain circumstances, a new aquaculture operation just starting up will qualify for these exemptions.

Contacts

PROVINCIAL GOVERNMENT

Lead Agency
Ministry of Agriculture and Fisheries
Aquaculture and Commercial Fisheries Branch
808 Douglas Street
Victoria, B.C.
V8W 2Z7
Telephone: 356-1600

Financial Assistance
Ministry of Agriculture and Fisheries
Agricultural Finance Branch
808 Douglas Street
Victoria, B.C.
V8W 2Z7
Telephone: 356-1643

Freshwater Fish Permits
(Ministry of Environment and Parks Regional Offices)

Lower Mainland Region (Surrey)	584-8822
Vancouver Island Region (Nanaimo)	758-3951
Thompson-Nicola Region (Kamloops)	374-9717
Kootenay Region (Nelson)	354-6333
Cariboo Region (Williams Lake)	398-4530
Skeena Region (Smithers)	847-7303
Omineca Region (Prince George)	565-6145
Okanagan Region (Penticton)	493-8261

Aquatic Land Leases/Licences
Ministry of Forests and Lands
Land Policy Branch
4000 Seymour Place
Victoria, B.C.
V8W 3E7
Telephone: 387-1800

Note: For aquatic Crown land applications, contact the following B.C. Lands District offices:

Lower Mainland Region (Burnaby)	660-5500
Vancouver Island Region (Victoria)	387-5011
Cariboo Region (Williams Lake)	398-4250
Skeena Region (Smithers)	847-7344
Thompson/Okanagan Region (Kamloops)	554-3144
Kootenay Region (Cranbrook)	426-1414
Omineca Region (Prince George)	565-6245

Water Licence
Ministry of Environment and Parks
Water Management Branch
765 Broughton Street
Victoria, B.C.
V8W 1X5
Telephone: 387-5981

Pollution Control Permit
Ministry of Environment and Parks
Waste Management Branch
810 Blanshard Street
Victoria, B.C.
V8W 1X5
Telephone: 387-9976

Vancouver Island Region (Nanaimo)	758-3951
Lower Mainland Region (Surrey)	584-8822
Southern Interior Region (Kamloops)	374-9717
Kootenay Region (Nelson)	354-6355
Northern Region (Prince George)	565-6155

Also contact regional offices listed under Pollution Control Permit

Business Registration
Registrar of Companies
Ministry of Finance and Corporate Relations
940 Blanshard Street
Victoria, B.C.
V8W 3E6

Telephone Information:	387-4471
Name Reservation:	387-5051

Sales Tax Exemption
Ministry of Finance and Corporate Relations
Consumer Taxation Branch
1061 Fort Street
Victoria, B.C.
V8V 3K3
Telephone: 387-0656

Business Counselling/Financial Assistance Programs
Ministry of Economic Development
Sixth Floor, 1405 Douglas Street
Victoria, B.C.
V8W 3C1
Telephone: General Information 383-1612

Vancouver office:
Ministry of Economic Development
315, 800 Hornby Street
Vancouver, B.C.
V6Z 2C5

Telephone: General Information 660-3900, Programs 660-1152

PROVINCE-WIDE TOLL-FREE TELEPHONE NUMBER FOR BUSINESS INFORMATION 1-800-663-0648

FEDERAL GOVERNMENT

Department Responsible
Department of Fisheries and Oceans
Federal Aquaculture Coordinator and Vancouver Office (Licences and Permits)
Pacific Region
1090 West Pender Street
Vancouver, B.C.
V6E 2P1
Telephone: 666-3545

Oceanographic Charts
Canadian Hydrographic Service
Department of Fisheries and Oceans
Institute of Ocean Sciences, Patricia Bay
9860 West Saanich Road
Box 6000
Sidney, B.C.
V8L 4B2
Telephone: 356-6348

Navigable Waters Protection Act
Coast Guard — Western Region
224 West Esplanade
North Vancouver, B.C.
V7M 3J7
Telephone: 984-3730

General Assistance/Program Referral
Canada Service Bureau
PROVINCE-WIDE TOLL-FREE TELEPHONE NUMBER
1-800-663-0433

OTHER

Salmon Broodstock Program
B.C. Research
3650 Wesbrook Mall
Vancouver, B.C.
V6S 2L2
Telephone: 224-4331

Transplant Committee
Ministry of Environment and Parks
Fisheries Branch
780 Blanshard Street
Victoria, B.C.
V8V 1X5
Telephone: 387-9589

Department of Fisheries and Oceans
Pacific Region
1090 West Pender Street
Vancouver, B.C.
V6E 2P1
Telephone: 666-3545

Associations
Salmon Farmers Association of B.C.
2459A Bellevue Ave.
West Vancouver, B.C.
V7V 1E1
Telephone: 922-4525

Aquaculture Association of B.C.
Site 52, Comp. 103
5331 Hammond Bay Road
Nanaimo, B.C.
V9V 5N7
Telephone: 758-2922

Sunshine Coast Aquaculture Association
Box 2360
Sechelt, B.C.
V0N 3A0
Telephone: 885-3619

North Island Mariculture Association
Box 1024
Port McNeill, B.C.
V0N 2R0
Telephone: 956-4008

B.C. Oyster Growers' Association and B.C. Oyster Board
Box 970
Ladysmith, B.C.
V0R 2E0
Telephone: 245-3213

Western Trout Farmers' Association
c/o Sun Valley Trout Farms Ltd.
31395 Silverdale Avenue
Mission, B.C.
V2V 4H9
Telephone: 826-6471
and/or

Western Trout Farmers' Association
c/o Spring Valley Trout Farms Ltd.
4788 — 232nd Street
Langley, B.C.
V3A 4R1
Telephone: 534-5580

Investment Information
Enterprise Centre
Infomart — General Information
750 Pacific Boulevard South
Vancouver, British Columbia
V6B 5E7
Telephone: 660-3900

Trade Fair
Food Pacific '88
B.C. Food Exhibitions Ltd.
190-10651 Shellbridge Way
Richmond, B.C.
V6X 2W8
Telephone: 276-2277

Aquaculture Education/Resources
Malaspina College
Aquaculture and Fisheries Technology Program
900 Fifth Street
Nanaimo, B.C.
V9R 5S5
Telephone: 753-3245

University of Victoria
Biology Department
Box 1700
Victoria, B.C.
V8W 2Y2
Telephone: 721-7094

University of British Columbia
Department of Bio-Resource Engineering
2357 Main Mall
Vancouver, B.C.
V6T 1W5
Telephone: 228-2565

B.C. Institute of Technology
Forest Resource Technology Program
3700 Willingdon Avenue
Burnaby, B.C.
V5G 3H2
Telephone: 434-5734

Sechelt School District 46
Box 220
Gibsons, B.C.
V0N 1V0
Telephone: Vancouver toll-free 669-4772 (local 27)
Local 886-8841

North Island College
156 Manor Drive
Comox, B.C.
V9N 6P7
Telephone: 339-5551

Note: North Island College's Introduction to Aquaculture is currently offered at the Campbell River Learning Centre.

Capilano College — Sechelt Campus
Aquaculture Resource Centre
Box 1609
Sechelt, B.C.
V0N 3A0
Telephone: Vancouver toll-free 987-1535 Local 885-9310

A Checklist For Getting Started In Aquaculture

- **Market evaluation**
- **Financing**
- **Site selection**
  - location and access
  - water depth and temperature
  - tide and wave action
  - water quality
  - farm facilities layout
  - available volume of water
- **Aquaculture development plan**
  - project schedule from inception to start up
  - species to be farmed
  - source of supply for eggs/seed stock
  - nutrition and health research
  - source of supply for food
  - staffing requirements
- **Business plan**
  - time to elapse before first product marketed
  - supply of operating capital
  - cash flow projections
  - contingency fund
  - anticipated market
- **Education and training of operator and staff**
- **Company registration (if necessary)**
- **Business licence**
- **Registration with producers' association**
- **Documentation**
  - zoning compliance
  - registration with Aquaculture and Commercial Fisheries Branch
  - registration with Oyster Marketing Board
  - aquatic land investigative permit/lease/licence
  - transplant approval
  - import permit
  - pollution control permit
  - water licence
  - commercial fish culture permit
  - navigation compliance
  - aquaculture permit